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TITLE: Public telephone network including a distributed imaging system

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PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4491873	January 1985	Takayama	
☐	4506111	March 1985	Takenouchi et al.	

☐	4523055	June 1985	Hohl et al.	
☐	4533943	August 1985	Poirier	358/85
☐	4573083	February 1986	Shimizu	
☐	4713780	December 1987	Schultz et al.	
☐	4852154	July 1989	Lewis et al.	
☐	4893333	January 1990	Baran et al.	
☐	4914586	April 1990	Swinehart et al.	
☐	4918722	April 1990	Duehren et al.	
☐	4922348	May 1990	Gillon et al.	
☐	4932042	June 1990	Baral et al.	
☐	4935955	June 1990	Neudorfer	
☐	4941170	July 1990	Herbst	
☐	4969184	November 1990	Gordon et al.	
☐	4972462	November 1990	Shibata	
☐	4974254	November 1990	Perine et al.	
☐	4985919	January 1991	Naruse et al.	
☐	4993025	February 1991	Vesel et al.	370/94.1
☐	5008926	April 1991	Misholi	
☐	5046088	September 1991	Margulies	
☐	5068745	November 1991	Shimura	
☐	5068888	November 1991	Scherk et al.	
☐	5095535	March 1992	Freeburg	

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
2211698	July 1989	GB	
91/01608	February 1991	WO	

OTHER PUBLICATIONS

Chorus Data Systems, New Product Information, Mar. 1988, pp. 1,2.
"Hitachi Gives `High Five` to Himall 20F" Oct. 1988, vol. 2, No. 10, p. 5, Buyers Laboratory Facsimile Machines, 20 Railroad Ave., Hackensack, N.J.
L. A. Business Systems CAN-FAX, Buyers Laboratories, Inc., Fax Reporter, Dec. 1988, vol. 2, pp. 3-5 .

ART-UNIT: 268

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ABSTRACT:

A public telephone network includes enhanced capabilities with a distributed imaging system. The imaging system interfaces with end users through appropriate bridges, routers and gateways to provide the user with a virtual local area network. Automatic number information (ANI) is used to automatically configure the system as required by the user. A central processing system performs text and image manipulation and transmission functions using the switched network facilities. Routing tables stored by the imaging system support automatic image and document routing functions.

20 Claims, 3 Drawing figures

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Abstract Text (1):
A public telephone network includes enhanced capabilities with a distributed imaging system. The imaging system interfaces with end users through appropriate bridges, routers and gateways to provide the user with a virtual local area network. Automatic number information (ANI) is used to automatically configure the system as required by the user. A central processing system performs text and image manipulation and transmission functions using the switched network facilities. Routing tables stored by the imaging system support automatic image and document routing functions.

Assignee Name (1):
Bell Atlantic Network Services, Inc.

Assignee Group (1):
Bell Atlantic Network Services, Inc. Arlington VA 02

Brief Summary Text (2):
The invention relates to enhanced functionality of a public telephone network and, in particular, to a distributed imaging system with a plurality of input/output nodes connected by a public telephone network to central or distributed image data processing and storage facilities.

Brief Summary Text (4):
In major industrial countries significant resources are dedicated to creating, processing and distributing information. To best utilize these assets, research has been directed toward information management efforts including how to best present the information to enhance its utilization. To this end, various systems have been proposed for providing high quality transmission of images with and without supporting text.

Brief Summary Text (5):
Technological support for information distribution has produced electronic systems for creating, compiling, editing, storing, accessing, and distributing high resolution image information. These technologies are directed to producing and/or supporting a paperless work environment wherein data is transmitted electronically over dedicated and public networks. As communications capabilities for the transmission of data have been enhanced by modern technologies, the forms of information transmitted have correspondingly grown.

Brief Summary Text (6):
Initial attempts at electronic information transfer were limited to the bilevel signaling of a single channel American Morse signal, followed by more sophisticated modulation techniques supporting analog speech, low and medium resolution facsimile images, digital data and slow and fast scan television signals.

Brief Summary Text (7):
Image management systems offer high resolution digital image data using computer

workstations. The workstations include powerful processors, large memories and high resolution bit-mapped displays providing 1,200 by 900 pixels (picture elements) or greater display resolution. Information for each pixel includes multiple level bit intensity information to create various shades of a gray scale and may include pixel color information. For example, by representing each pixel by 8 bits of intensity data, 256 intensity levels can be displayed. Bit color information can be stored as separate intensity levels for each of the primary colors, red, green and blue. Using windowing techniques, multiple images can be concurrently displayed on a monitor.

Brief Summary Text (8):
In a multi-media, multi-source information retrieval system, both textual and image data is made available to a system user on a display and/or hardcopy printing device. Multi-media workstations combine high resolution images with supporting text, data and other media including video while separately maintaining the underlying image and text data. Images are typically stored as bit-mapped data described above and text as string data is stored using conventional encoding standards such as ASCII.

Brief Summary Text (9):
Textual information provided to a user is available from several sources including other users, private and commercial data bases, and automated electronic information services. High resolution image data is available from similar sources and may include medical imaging data, photographic images, electronic graphics, frame grabber television pictures, etc. The original input image data can be manipulated and combined with other displayable data including other images and text to form "composite" image data.

Brief Summary Text (10):
Duehran et al U.S. Pat. No. 4,918,722 describes a method for sending a selected message comprising binary encoded character data or facsimile encoded data stored at a first location to any specified remote location accessible from the first location via the public switched telephone network. The method includes the steps of storing the messages at the first location and thereafter receiving at the first location via the public switched telephone network, delivery commands issued by any remote telephone device identifying the selected message and specified remote location. The commands are decoded to identify the selected message and specified remote location and the selected message is recovered from the stored messages. A telephone call is initiated to the specified remote location and sent to a facsimile capable receiving device at the specified remote location via the public switched telephone network in a facsimile compatible form.

Brief Summary Text (11):
Gordon et al. U.S. Pat. No. 4,969,184 is directed to facsimile message transmission between end devices via a public switched telephone network and a "process intermediary unit." The purpose of this arrangement is to eliminate the need for the subscriber at the destination to have a dedicated telephone line while giving the appearance at the originating device of dedicated line transmission.

Brief Summary Text (12):
The intermediary unit includes a block of telephone number addresses (TNA's) which may be leased or purchased. These addresses, which are associated with particular subscribers, do not represent dedicated telephone lines. When used, communication is established with a "local node" by means of a DID trunk line if one is available. For long distance communication, a number of local nodes are interconnected by a digital data transmission network. At least some of the transmitting/receiving devices have unique telephone number addresses which, when used, results in telephone connection with the intermediary unit, the telephone number addresses being recorded and used by the intermediary unit to identify the receiving devices to which data is to be transmitted.

Brief Summary Text (13):
Gillon et al U.S. Pat. No. 4,922,348 is directed to communication of facsimile data. Facsimile image signals are transmitted from facsimile sources by means of simple standard user interfaces and the telephone lines. A facsimile call is set up by dialing a destination number to automatically route to data storage facilities of a switched network. Facsimile data stored in the network is transmitted to a facsimile destination. The switched network may be a private switched network, a public switched network or a private branch exchange. The network may be arranged to distribute a facsimile document to a plurality of destinations with only one transmission from any source. If the destination is unavailable, the facsimile signals can be stored until the destination becomes available.

Brief Summary Text (17):
While various systems for providing and processing image data are available, and more are under development, the systems are not easily integrated to accommodate sharing and distribution of information between systems. Local networks interconnect workstations at a user site and gateways can be used to interface the local network with other similar systems. However, because of incompatibility between systems, interfacing between different systems is difficult or impractical. Due to initial costs of system procurement, training, and maintenance of a particular imaging or multi-media system, users are reluctant to invest in present state-of-the-art systems which may be obsolete in the near future. Still another problem with present imaging systems is unavailability of compatible image data bases. A further shortcoming of imaging systems is the relatively high start-up costs of required software and hardware.

Brief Summary Text (23):
According to one aspect of the invention, it is integrated with a telecommunications system which includes a plurality of switches interconnected by trunks, a plurality of subscriber stations arranged in groups with each group being served by one of the switching means, a plurality of subscriber lines connecting each switching means with the group of subscriber switching stations served thereby, and a switching network in each switching means for establishing communication paths between calling subscriber stations and called subscriber stations. A backbone digital data network transmits digital data using a first communications protocol. A gateway interface receives command and digital image data signals having a second communications protocol from one of the subscriber stations and converts second communications protocol of the command and digital image data signals into the first communications protocol. The gateway supplies the converted command and digital image data signals to the backbone network. The digital image data signals may include multilevel pixel intensity data to provide a graduated gray scale capability.

Brief Summary Text (24):
An image memory stores bit mapped image data as multilevel pixel density information. A processor receives the converted command and digital image data signals from the backbone network and, in response, selectively stores and retrieves the image data into and out from the image memory means over the backbone network.

Brief Summary Text (26):
A central processor includes data storage connected to the central processor means for storing the original and composite image data and a graphics processor receiving the image manipulation commands from the input/output means and, in response, retrieving and combining the original image data to form the composite image data. Further associated with the central processor is a routing table memory for storing sequences of addresses, and a communications processor responsive to automatic number identification (ANI) data, i.e., originating terminal identification information (OTII), and to the addresses stored in the routing table

for supplying the composite image data. Providing connectivity for transmitting the image manipulation commands and the data retrieval and storage commands from the remote user terminal stations to the central processor means and for transmitting the original image data and the composite image data from the central processor means to the remote user terminal station is a public switched telephone system for connecting the remote user terminal stations to the central processor means. Automatic number identification facilities are used for automatically supplying the ANI data identifying ones of the remote user terminal stations on the public switched telephone network.

Detailed Description Text (3):
The switched telephone system includes facilities for providing image and database management functionality as well as tools to build and manage user applications. The functionality is hardware/software based and is provided to end users over various network communications facilities. End users of the system maintain local equipment (i.e., workstations, scanners, etc.).

Detailed Description Text (5):
The distributed imaging architecture is illustrated in FIG. 1. Referring to that diagram multiple customer sites are illustrated at A, B, C and D connected to the telephone network and imaging facility at E.

Detailed Description Text (6):
Referring to the topmost site A user premise indicated generally at 8, a first user may have a local area network (LAN) 10 connecting workstations 12, a document scanner 14 and a host computer 16. A similar user premise installation 17 is illustrated at LAN 18 in the lowermost user premise site illustrated at B. The LANs can be one of several commercially available hardware and software configurations for interconnecting workstations or personal computers (PCs) with various peripherals, routers and/or gateways. ETHERNET is an example of a commercial LAN providing sufficient bandwidth for the efficient transfer of high resolution image data. Similarly, commercially available routers 30 interface LAN 10 to the central office backbone network 28 and include circuitry for performing protocol conversion between networks. Routers 30, gateways 32 and bridges 34 perform similar functions, primarily differing in the number of layers converted to interface the respective networks.

Detailed Description Text (7):
Routers 30 support one or more physical links. Upon receipt of digitized data in a packet format, the router examines the data to select the required output link. In some protocols, such as X.25, the routing decision is made at call-establishment. If the protocol does not include this information, then each packet of data is examined by router 30 to correctly route the data. The routing capability of the Public Telephone Network is functionally equivalent to routers 30. The protocols also support identification of the originating station as required or optional data provided in a packet header field.

Detailed Description Text (9):
Routers 30 can be connected using a standard two or four wire subscriber loop to a local office at data rates of 4800 to 9600 baud. Connectivity can alternatively be provided by an ISDN or T1 link to support data transfer rates of up to 1.544 megabits per second. Using switched multi-megabit digital service (SMDS), higher data transfer rates are possible. Layered on the physical connectivity, protocols such as TCP/IP (transmission control protocol and internet protocol), ISO, SNA (systems network architecture), and SDLC (system or synchronous data link control) to provide required handshaking between routers and the respective networks.

Detailed Description Text (10):
A different LAN configuration 21 is depicted at 20 at another user premise B. This ring architecture LAN connects workstations 22, a scanner 24 and host computer 26.

A still further user premise installation or plural installations are indicated at site C comprising fax machines 27 and 29 and a personal computer (PC) 31. These devices are connected through an analog or digital voice or data switch 44 and provide signals which are carried in the voice channel. The configuration at site D is essentially the same as at site A, differing in that bridges are used to interface the local area network bus 18 to backbone network 28.

Detailed Description Text (11):
The user LANs 10, 18 and 20 are respectively tied to backbone network 28 through routers 30, bridges 34 and gateways 32. The minimum hardware configuration required in order to tie into the system is a PC linked to a telecommunications line capable of transmitting data to the bus 28. As discussed above, the line can be a standard class user loop supporting analog signals between approximately 300 and 3400 Hz usable at rates of up to 4800-9600 baud. Alternatively, wider bandwidth connectivity can be provided over digital transmission media to support higher data transmission rates.

Detailed Description Text (12):
The public telephone switching system installation illustrated at E includes long term storage shown as optical storage in the "jukebox" 34 tied to the bus by a file server 36. The jukebox includes a plurality of robotically changeable media such as optical disks which can be WORM (write once, read many) or erasable. The format of the optical disks includes 5 1/4, 10, 12 or 14 inch type platters. Alternatively, the jukebox can include a mechanism for changing and reading/writing magnetic format media such as of VCR tapes. The jukebox is intended to be for additional data storage. Data stored in the jukebox may have a high degree of data compression to maximize data storage capacity of the device.

Detailed Description Text (13):
Short term magnetic storage is provided at 38 also tied to the bus through a file server 40. The short term storage can include hard disk drives, bubble memories, solid-state disks, and other high speed access mass storage devices. The magnetic storage is used to support system virtual memory requirements and for storage of system data and programs, index information and application programs and data including image data. A fax server 42 including fax storage 43 is connected between the bus and the switch 44 connected to fax or PC terminals 27, 29 and 31.

Detailed Description Text (15):
Processor 50 can also support security functions such as data encryption/decryption and electronic signature processing using, for example, the National Institute of Standards and Technology Data Encryption Standard (DES). Data encryption increases system security and further restricts unauthorized use of information transmitted to, and stored on, the backbone network. In cooperation with the respective user terminal and/or local computer, data is encrypted using a key known only to the user. The user can supply a key to decrypt data for system use if required for system performed data manipulation routines. Data decryption keys can also be supplied to destination end users to regenerate the original data.

Detailed Description Text (17):
The imaging equipment supporting system functionality resides at a central facility or MOC (Minicomputer Operations Center). The short term storage receives input from the scanners and stores the data for approximately 60 days of short term storage. Beyond that the data will be automatically ported over to the long term optical storage where it remains for about a year or longer. Following that the disks are taken out of the jukebox and shelved for indefinite storage. The fax server constitutes another interface between fax machines 27 and 29 and PC 31 (generating a fax signal) and the fax server storage 43. Fax signal inputs may also come from the workstations 12 provided with fax boards. The facsimile images reconverted by the fax server into bit mapped image data and supplied to backbone network 28. Processor 50 controls bus traffic, routing the converted image data to the

appropriate file server or user through the respective bridge, router or gateway equipment.

Detailed Description Text (19):
The user hardware may comprise a range of equipment, ranging from a single PC station with a communications link as shown at site C to a complete local area networking system on the premises as shown at sites A, B and D. Such a network may have multiple PCs, servers, hosts, etc. The LAN has a communications link including protocol conversion to tie into a telecommunications line provided to tie into the centralized platform which provides a central imaging facility. The hardware in the illustrated and described architecture is adapted to provide multi-media and high resolution imaging. Within that category, hardware is provided to support many services including imaging mailbox, simple storage, dial-up services such as yellow pages, image bulletin board, etc. Direct Inward Dialing (DID) availability can be provided.

Detailed Description Text (22):
The distributed imaging system is capable of providing a virtual local area network for an office or business that does not have one. As one example for a law firm, the system may provide not only word processing text but database programs. All office functions may be inserted into a standardized processing form which anyone in the office can access. The law firm would purchase a program of law books and texts and provide relational searches for anything related to whatever subject is desired. Contracts may be stored and retrieved with signatures.

Detailed Description Text (23):
The virtual local area network function is supported by including address tables for each user network at the central processing facility. The virtual network may also encompass other user facilities by including appropriate routing information tables.

Detailed Description Text (24):
Another feature of the system is the provision of automatic routing of image and text data between and among system users. Routing information is contained in data tables stored in system memory including address information and access authority. FIG. 2 depicts an image data structure including fields for data routing and access codes. For example, a first operator may scan a document to be routed through several other users for approval and addition of further information. The routing table stored in the system may provide the required addresses to automatically assure that the proper user defined electronic document handling protocol is followed. The data table may indicate the authority of each user to modify or add to the electronic document images during processing through the virtual network. Processing may also include electronic signature of authorizing users and would maintain an electronic "paper trail" without the paper. Supervisory access would support document auditing to determine document status and statistics on work processes.

Detailed Description Text (25):
In order to use the system, a user initiates a service request to the public telephone system using a workstation or PC. A block diagram of a multimedia imaging workstation is presented in FIG. 3. Upon acknowledgment, the user provides address and access data to establish connectivity between the user computer or network through the appropriate interfacing equipment and central backbone network to the central processor. The central processor acknowledges establishment of connectivity with the user and performs access security checking and other house keeping functions. Automatic number identification (ANI) information, also referred to as originating terminal identification information (OTII), is provided from switching equipment or from the originating terminal in the form of packet header information to the central processor. The central processor uses the OTII to confirm user identity and to automatically configure the system by (i) loading appropriate

interface software and parameters into respective routers and/or gateways and (ii) loading appropriate routing tables and application programs. OTII identifies the originating station or terminal and may be supplied by the originating workstation as separate data, as apart of a data header, or embedded in the communications protocol. Thus, multiple terminals networked onto a common gateway channel may be uniquely identified. OTII may also be generated by the CO serving the originating station and may include Caller Identification (Caller ID) data corresponding to the line identification, i.e., telephone number of the originating station or terminal. ANI data may be used for billing purposes. In particular, charges for connect time, memory and processor usage and input/output can be recorded based on the ANI data.

Detailed Description Text (31):
Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by terms of the appended claims. For example, other network configurations are possible. Hardware may be distributed throughout the public switched telephone network to obtain the advantages of a distributed processing environment. Image data can be combined with audio information to provide further enhancements to multimedia presentations.

Other Reference Publication (2):
"Hitachi Gives `High Five` to Himall 20F" Oct. 1988, vol. 2, No. 10, p. 5, Buyers Laboratory Facsimile Machines, 20 Railroad Ave., Hackensack, N.J.

CLAIMS:

1. A distributed image processing system, comprising:

(a) a plurality of remote user terminal stations for inputting and processing image processing commands from a plurality of respective users, each of said remote user terminal stations including

(i) local processor means responsive to said image processing commands for supplying data retrieval commands and image manipulation commands, and

(ii) image information input/output means for receiving and transmitting image data;

(b) central processor means including

(i) data storage means responsive to said data retrieval commands for supplying said image information, and

(ii) communications processor means responsive to originating terminal identification information for supplying and manipulating said image information from said data storage means based on stored image manipulation commands corresponding to said originating terminal identification information and sending said image information to said image information input means; and

(c) connectivity means for transmitting said image manipulation commands and said data retrieval commands from said plurality of remote user terminal stations to said central processor means and for transmitting image information from said central processor means to said plurality of remote user terminal stations, said connectivity means including

(i) a public telephone network (PTN) for connecting said plurality of remote user terminal stations to said central processor means, and

(ii) originating terminal identification means for automatically supplying said

originating terminal identification information identifying each of said plurality of remote user terminal stations on said public telephone network to said communications processor means.

14. The distributed image processing system according to claim 13 wherein said connectivity means includes a public telephone network for connecting said plurality of remote user terminal stations to said central processor means.

15. The distributed image processing system according to claim 14 wherein said connectivity means further includes automatic number identification means for automatically supplying said originating terminal identification information to said central processor means for identifying each of said plurality of remote user terminal stations on said public telephone network.

18. The distributed image processing system according to claim 17 wherein said connectivity means includes a public telephone network for connecting said plurality of remote user terminal stations to said central processor means.

19. The distributed image processing system according to claim 18 wherein said connectivity means further includes automatic number identification means for automatically supplying said originating terminal identification information identifying of each of said plurality of remote user terminal stations to said communications processor means on said public telephone network.

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